

CLAIMS

1. A laser image display apparatus comprising:
 - a laser light source;
 - a light diffuser containing light diffusing elements, the light diffusing elements moving, swaying or oscillating;
 - an illumination optical system which irradiates rays of light from the laser light source to the light diffuser;
 - a spatial light modulator which is arranged near the light diffuser and irradiated by rays of light diffused by the light diffuser to produce image; and
 - a projection lens which projects to a predetermined plane in space an image produced by the spatial light modulator,
 wherein a light diffusing angle θ of the light diffuser, a pitch P of transmission irregularity generated in the light scattering means, a numerical aperture NA of the illumination optical system, and a distance L between the spatial light modulator and the light diffuser have a relationship of $P < 2 \times \tan(\theta/2 + \sin^{-1}(NA)) \times L$.

2. A laser image display apparatus according to claim 1, wherein a light diffusing angle θ of the light diffuser, a numerical aperture NA of the illumination optical system, a distance L between the spatial light modulator and the light diffuser and a diagonal screen size D of the spatial light modulator have a relationship of $\tan(\theta/2 + \sin^{-1}(NA)) \times L < D/3$.

3. A laser image display apparatus comprising:
 - a laser light source;
 - a light diffuser containing light diffusing elements, the light diffusing elements moving, swaying or oscillating;
 - an illumination optical system which irradiates rays of light from the laser light source to the light diffuser;
 - a spatial light modulator which is arranged near the light diffuser and irradiated by rays of light diffused by the light diffuser to produce image; and

a projection lens which projects to a predetermined plane in space an image produced by the spatial light modulator,

wherein a light diffusing angle θ of the light diffuser, a numerical aperture NA of the illumination optical system, a distance L between the spatial light modulator and the light diffuser and a diagonal screen size D of the spatial light modulator have a relationship of $\tan(\theta/2 + \sin^{-1}(NA)) \times L < D/3$.

4. A laser image display apparatus according to any one of claims 1 to 3, wherein the light diffusing elements move, sway or oscillate in response to a voltage applied to the light diffuser.

5. A laser image display apparatus according to claim 4, wherein the light diffuser has a plurality of electrodes, and movement of the light diffusing elements is controlled by a voltage applied to each of the plurality of electrodes.

6. A laser image display apparatus according to any one of claims 1 to 3, wherein the light diffusing elements move, sway or oscillate in response to a heat applied to the light diffuser.

7. A laser image display apparatus according to any one of claims 1 to 3, wherein the light diffusing elements move, sway or oscillate in response to a sound wave applied to the light diffuser.

8. A laser image display apparatus according to any one of claims 1 to 3, wherein the light diffusing elements move, sway or oscillate in response to a magnetic field applied to the light diffuser.

9. A laser image display apparatus according to any one of claims 1 to 3, wherein the light diffusing elements are contained with a solvent, and the solvent moves, sways or oscillates.

10. A laser image display apparatus according to any one of claims 1 to 9, wherein the light diffusing elements include two or more kinds of substances having different features from one another.

11. A laser image display apparatus according to any one of claims 1 to 5, wherein the light diffusing elements include two or more kinds of liquid crystals having different polarizations from one another.

12. A laser image display apparatus according to any one of claims 1 to 10, wherein the light diffusing elements include two or more kinds of particles having different polarizations from one another.

13. A laser image display apparatus according to any one of claims 1 to 12, wherein the light diffuser is integrated with the spatial light modulator.

14. A laser image display apparatus according to claim 13, wherein the spatial light modulator executes light modulation by a liquid crystal.

15. A laser image display apparatus according to claim 14, wherein the spatial light modulator executes light modulation by a reflective liquid crystal.

16. A laser image display apparatus according to any one of claims 1 to 15, wherein:

the laser light source comprises a laser light source emitting a ray of red laser light, a laser light source emitting a ray of blue laser light, and a laser light source emitting a ray of red laser light,

the rays of laser light emitted from the laser light sources are combined to a single ray of laser light after being passed through the light diffusers, the illumination optical

systems and the spatial light modulators which are arranged with the respective laser light sources, and

the projection lens projects the combined laser light to a predetermined plane in space.